International General Certificate of Secondary Education

UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE

PHYSICS 0625/5

PAPER 5 Practical Test

Monday **22 NOVEMBER 1999** Morning 1 hour 15 minutes

Candidates answer on the enclosed answer booklet.
Additional materials:
As listed in Instructions to Supervisors
Mathematical tables and/or Electronic calculator
300 mm rule

TIME 1 hour 15 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces provided on the answer booklet.

Answer **all** questions.

Write your answers in the spaces provided on the answer booklet.

You are expected to record all your observations as soon as these observations are made. These observations and any arithmetical working of the answers from them should be written in the answer booklet; scrap paper should **not** be used.

An account of the method of carrying out the experiments is **not** required but you should record any precautions you take, and it must be clear (by diagrams or otherwise) how the readings were obtained. The theory of the experiments is **not** required.

At the end of the examination, hand in only the answer booklet.

INFORMATION FOR CANDIDATES

Graph paper is provided in the enclosed answer booklet. Additional sheets of graph paper should be used only if it is necessary to do so.

This question paper consists of 9 printed pages, 3 blank pages and an inserted answer booklet.

© UCLES 1999
[Turn over

1 In this experiment, you are to investigate how the converging power of a beaker containing sugar solution changes as the concentration of the sugar solutions changes.

All of your observations and answers should be recorded on pages 2 and 3 of your Answer Booklet.

Carry out the following instructions, referring to Fig. 1.1.

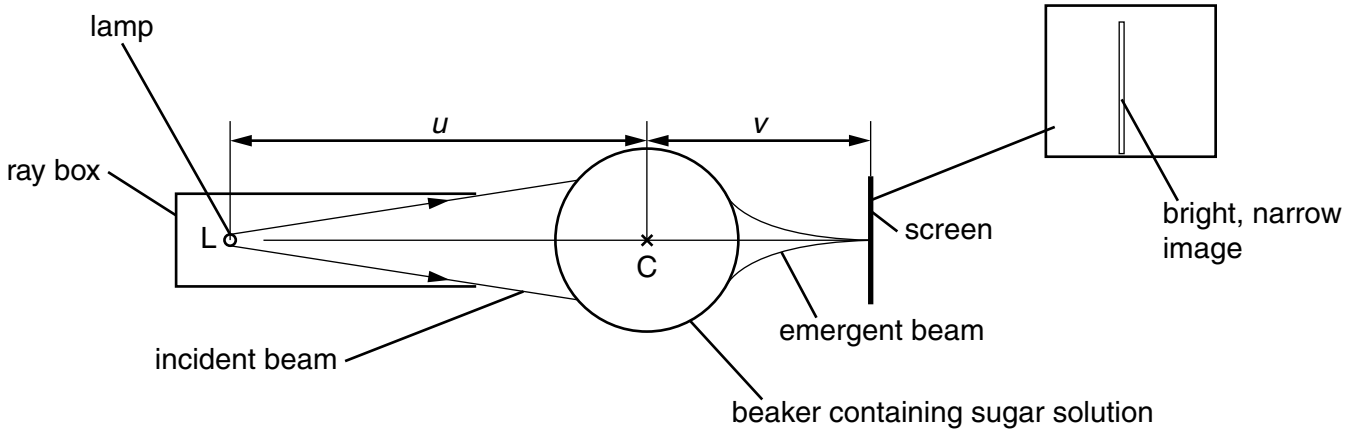

Fig. 1.1

(a) Place the beaker labelled **0 g of sugar** on page 2 of your Answer Booklet, so that the cross on the base of the beaker is above the point **C**.

Place the ray box so that the lamp is just above the point L. The centre of the broad incident beam should be along the line LC. Ask for help if you have any problems. Place the screen at the approximate point where the emergent beam is brought to a focus. Move the screen backwards and forwards until you obtain an image that is the brightest, narrowest vertical line. Draw a line on your answer booklet across the front of the screen and label this line **0 g**.

Remove the beaker.

(b) Check that the ray box has not moved and that the lamp is above the point L.

Repeat **(a)** for the beaker labelled **25 g of sugar**. Label the line **25 g**.

(c) Repeat **(b)** for the beakers containing **50 g of sugar** and **75 g of sugar**. Label the lines **50 g** and **75 g** respectively.

Remove the ray box and the beaker.

(d) Measure the length v_0, in mm, from C to the line labelled **0 g** and also the corresponding values v_{25}, v_{50}, and v_{75}. Measure the length u, in mm, between L and C.

Record these values in column 1 in the table in your Answer Booklet. Convert these values (which are in mm) to values in metres and complete column 2.

(e) The power of your optical system can be approximated by using the formula below, where u and v are in metres.

$$\text{power} = \frac{1}{u} + \frac{1}{v}$$

Calculate the power of each optical system.

(f) Complete the statement in your Answer Booklet relating the concentration of the sugar solution to the power of the system.

2 In this experiment, you are to investigate the resistance within a battery.

All of your observations and answers should be recorded on pages 4 and 5 of your Answer Booklet.

Carry out the following instructions, referring to Fig. 2.1.

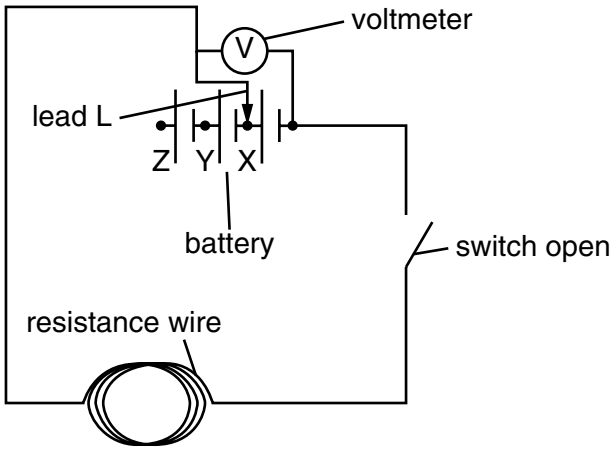

Fig. 2.1

(a) From the card provided, copy the values of the electric currents I_X, I_Y and I_Z into the table in your Answer Booklet. These are the values of the current in the circuit when lead L is connected in turn to X, Y and Z.

The apparatus has been set up for you with lead L connected to X and the switch open.

(b) In the table in **(a)** of your Answer Booklet, record the voltmeter reading V_0 with the switch open.

(c) Close the switch.

Observe what happens to the reading on the voltmeter. Complete the tick box in your Answer Booklet.

In the table, record the voltmeter reading V_c with the switch closed.

Open the switch.

(d) Calculate the resistance R_w of the resistance wire using the formula

$$R_W = \frac{V_c}{I_X}.$$

R_T is the total resistance of the resistance of the wire and of the resistance within the battery. Calculate R_T using the formula

$$R_T = \frac{V_o}{I_X}.$$

Determine the value of the resistance within the battery.

(e) Check that the switch is open.

Disconnect lead L from X and connect it to Y. In the table record the new value of V_0.

Close the switch and record V_c. Open the switch as soon as possible after taking the reading.

Repeat **(d)** for lead L connected to Y.

(f) Check that the switch is open.

Disconnect lead L from Y and connect it to Z. In the table record the new value of V_0.

Close the switch and record V_c. The voltmeter reading may continue to fall. Wait a few seconds before recording the value.

Open the switch as soon as possible after taking the reading.

Repeat **(d)** for lead L connected to Z.

(g) When the current in the circuit increased, what happened to the resistance of the wire?

(h) The battery consists of three cells. Calculate the average resistance within **one** cell.

3 In this experiment, you are to investigate the depression of the free end of a wooden beam when masses are added.

All of your observations and answers should be recorded on pages 6 and 7 of your Answer Booklet.

Carry out the following instructions, referring to Fig. 3.1.

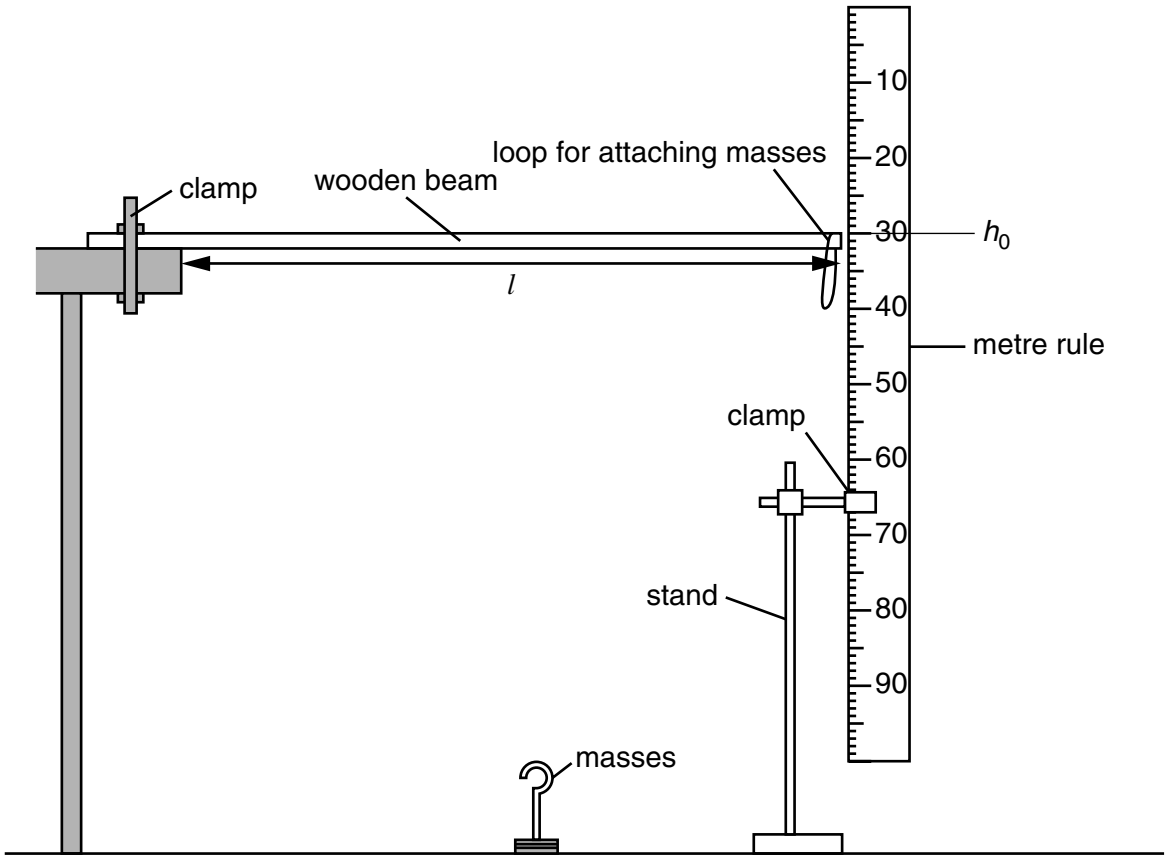

Fig. 3.1

(a) Record the length l of the wooden beam overhanging the table or bench.

Read the position h_0 on the metre rule of the top edge of the wooden beam. Record the value in your Answer Booklet.

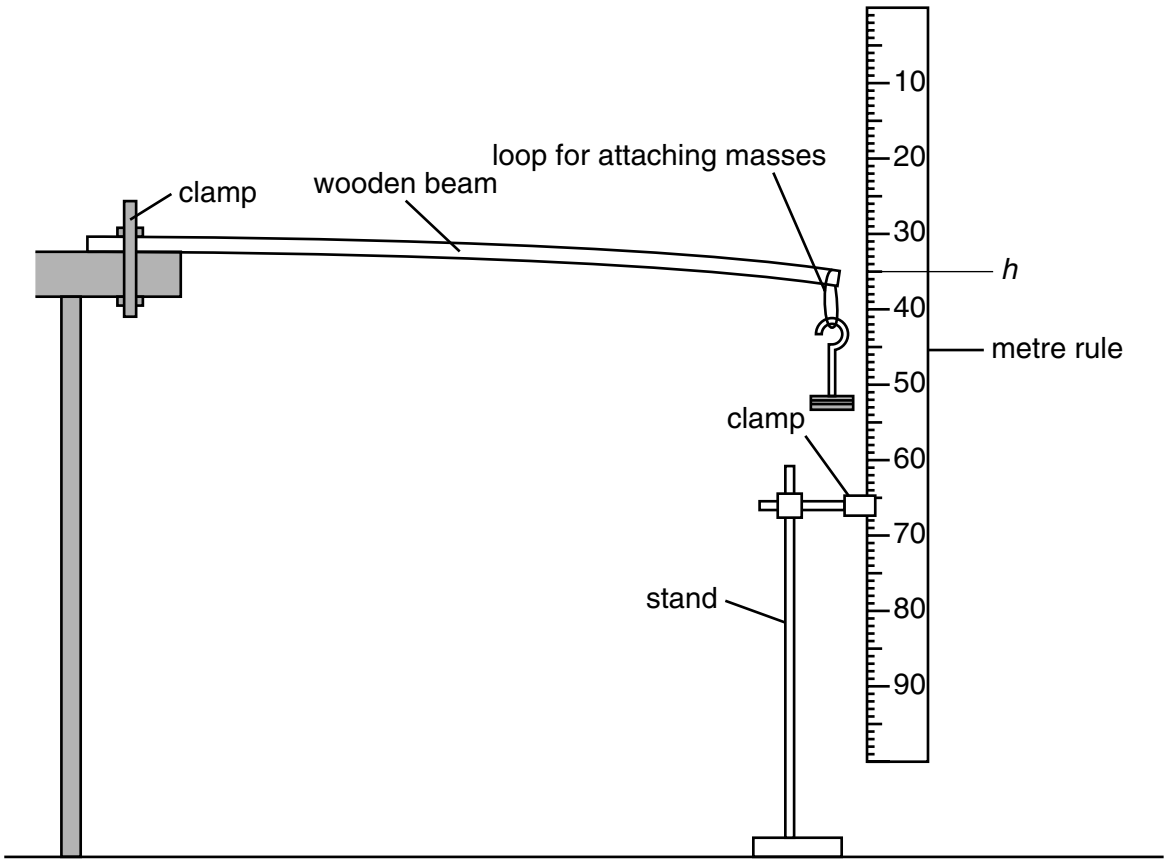

Fig. 3.2

(b) Hang a mass *L* of 100 g from the loop. If necessary, move the metre rule sideways to make sure that the masses do not rub against the rule.

Fig. 3.2 shows the end of the beam depressed, with the new position *h*.

You are provided with a small rule. Explain how you should use this small rule to improve the accuracy of your reading of *h*.

Read and record your values of *L* and of *h* in the table in your Answer Booklet.

(c) Add a further 100 g mass to the beam, so that *L* = 200 g. In the table, record the new values of *L* and of *h*.

(d) Repeat **(c)** for *L* = 300 g, 400 g, 500 g and 600 g.

(e) For each set of values of *L* and of *h*, calculate the depression of the beam using the formula $d = h - h_0$. Include these values in the table.

(f) On the grid provided on page 7 of your Answer Booklet, plot a graph of *d*/cm [*y*-axis] against *L*/g [*x*-axis]. Draw the line of best fit.

4 In this experiment, you are to investigate how changing the length and mass of a pendulum affects its period of oscillation.

All of your observations and answers should be recorded on page 8 of your Answer Booklet.

Carry out the following instructions, referring to Fig. 4.1.

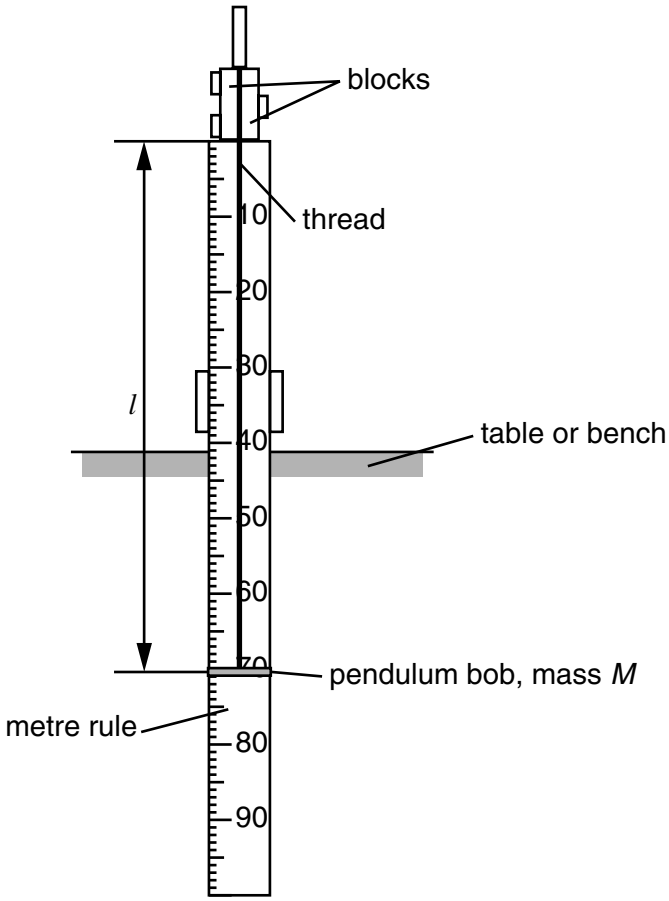

Fig. 4.1

(a) The apparatus has been set up for you with the pendulum bob having a mass M of 20 g and the pendulum length l of 70 cm.

Pull the bob about 5 cm to one side. Release the bob. Measure the time t_1 for 10 oscillations. Record the value in Table 1.

(b) Without changing the length or the mass of the pendulum obtain a second value t_2 for 10 oscillations. Record the value in Table 1. Calculate the average time $t_{average}$ for ten oscillations. Record the value in Table 1.

(c) With l = 60 cm and M = 20 g, measure and record t_1 and t_2. Calculate $t_{average}$.

(d) Repeat **(c)** for l = 50 cm and M = 20 g.

(e) You are now going to change the mass of the pendulum bob keeping l = 50 cm.

Copy your results from the **last** row of Table 1 into the **first** row of Table 2.

(f) Increase the mass M to 40 g and measure t_1 and t_2. Calculate $t_{average}$. Record the values in Table 2.

(g) Repeat **(f)** for $M = 50$ g.

(h) Use your results in **Table 1** to describe how $t_{average}$ changes as l is increased.

(i) Use your results in **Table 2** to describe any effect of a change in M on $t_{average}$.

BLANK PAGE

BLANK PAGE

BLANK PAGE